

IN THE CLAIMS:

Please substitute the following claims for the same-numbered claims in the application:

1. (Currently Amended) A method of manufacturing a metal UMoly mask for an integrated circuit chip interconnect solder bump, said method comprising:
depositing a photoresist on both sides of a molybdenum foil sheet, wherein said molybdenum foil sheet is approximately 8 mils thick and said photoresist is approximately 12 microns thick;
exposing and developing said photoresist to have at least one opening having a first diameter of approximately 4 mil; and
simultaneously etching both sides of said molybdenum foil sheet for a time period sufficient to produce a via through said molybdenum foil sheet such that said via has a second diameter of approximately 12 mils and a knife-edge of approximately 0.2 mils.
wherein said etching comprises using an etchant spray with a pressure of approximately 5 psi and undercutting said photoresist adjacent to said at least one opening to form an unsupported edge of said photoresist, and
wherein said depositing of said photoresist that is approximately 12 microns thick and said using of said etchant spray with said pressure of approximately 5 psi ensures that after said time period said unsupported edge survives.
2. (Canceled).
3. (Currently Amended) The method in claim 1, ~~wherein said etching process undercuts molybdenum adjacent said photoresist, leaving an unsupported edge of said photoresist after completion of said etching process~~ wherein ensuring that said unsupported edge survives allows reliable image formation to be achieved.

4. (Currently Amended) The method in claim ~~[[3]]~~ 1, further comprising adjusting the pH of said etchant spray at least three times during said etching process to maintain the etching rate.
5. (Original) The method in claim 4, wherein said process of adjusting the pH of said etchant spray comprises adding sodium hydroxide to said etchant spray.
6. (Original) The method in claim 1, wherein said etching process further comprises monitoring and controlling:
 - the concentration of molybdate complex;
 - Fe concentration; and
 - Oxidation/Reduction Potential (ORP).
7. (Currently Amended) A method of manufacturing a metal TMoly mask for a tin-rich cap of an integrated circuit chip interconnect solder bump, said method comprising:
 - depositing a photoresist on both sides of a molybdenum foil sheet, wherein said molybdenum foil sheet is approximately 4 mils thick and said photoresist is approximately 12 microns thick;
 - exposing and developing said photoresist to have ~~at least one~~ a first opening on a first side of said molybdenum foil sheet and a second opening on a second side of said molybdenum foil sheet, wherein said first opening has a first diameter of approximately 7 mils and said second opening has a second diameter of approximately 11 mils having a diameter of at least approximately 7 mil; and
 - simultaneously etching both sides of said molybdenum foil sheet for a time period sufficient to produce a via through said molybdenum foil sheet such that said via has a third diameter of approximately 10 mils adjacent to said first opening, a fourth diameter of approximately 14 mils adjacent to said second opening and a knife-edge of approximately 0.2mils.

wherein said etching comprises using an etchant spray with a pressure of approximately 5psi and undercutting said photoresist adjacent to both said first opening and said second opening to form an unsupported edge of said photoresist, and

wherein said depositing of said photoresist that is approximately 12 microns thick and said using of said etchant spray with said pressure of approximately 5 psi ensures that after said time period said unsupported edge survives.

8. (Canceled).

9. (Currently Amended) The method in claim [[8]] 7, wherein said etching process produces an asymmetric via that is smaller on said first side of said molybdenum foil sheet when compared to said second side of said molybdenum foil sheet.

10. (Currently Amended) The method in claim 7, ~~wherein said etching process undercuts molybdenum adjacent said photoresist, leaving an unsupported edge of said photoresist after completion of said etching process~~ wherein ensuring that after said time period said unsupported edge survives allows reliable image formation to be achieved.

11. (Currently Amended) The method in claim [[10]] 7, further comprising adjusting the pH of said etchant spray at least three times during said etching process maintain the etching rate.

12. (Original) The method in claim 11, wherein said process of adjusting the pH of said etchant spray comprises adding sodium hydroxide to said etchant spray.

13. (Original) The method in claim 7, further comprising removing said photoresist after said etching process.

14. (Original) The method in claim 7, wherein said etching process further comprises monitoring and controlling:

the concentration of molybdate complex;
Fe concentration; and
Oxidation/Reduction Potential (ORP).

15. (Currently Amended) A method of manufacturing a metal UMoly mask for an integrated circuit chip interconnect solder bump, said method comprising:

depositing a photoresist on both sides of a molybdenum foil sheet, wherein said molybdenum foil sheet is approximately 8 mils thick and said photoresist is approximately 12 microns thick;

exposing and developing said photoresist to have at least one opening having a first diameter of approximately 4 mil; and

simultaneously etching both sides of said molybdenum foil for a time period sufficient to produce a via through said molybdenum foil sheet such that said via has a second diameter of approximately 12 mils and a knife-edge of approximately 0.2mils,

wherein said etching comprises:

using an etchant spray with a pressure of approximately 5 psi, wherein said etching process forms at least one via in said molybdenum foil sheet, and wherein said via has a diameter of approximately 12 mil and a knife edge of approximately 0.2 mil;

periodically adjusting a chemistry of said etchant spray to avoid a reduction in etchant activity; and

undercutting said photoresist adjacent to said at least one opening to form an unsupported edge of said photoresist, and

wherein said depositing of said photoresist that is approximately 12 microns thick, said using of said etchant spray with said pressure of approximately 5 psi, and said adjusting of said chemistry ensures that after said time period said unsupported edge survives.

16. (Currently Amended) The method in claim 15, ~~wherein said etching process undercuts molybdenum adjacent said photoresist, leaving an unsupported edge of said photoresist after completion of said etching process~~ wherein ensuring that after said time period said unsupported edge survives allows reliable image formation to be achieved.

17. (Currently Amended) The method in claim ~~[[16]]~~ 15, ~~further comprising~~ wherein said adjusting of said chemistry comprises adjusting the pH of said etchant spray at least three times during said etching process to prevent damaging said unsupported edge of said photoresist.

18. (Original) The method in claim 17, wherein said process of adjusting the pH of said etchant spray comprises adding sodium hydroxide to said etchant spray.

19. (Original) The method in claim 15, further comprising removing said photoresist after said etching process.

20. (Currently Amended) The method in claim 15, wherein said ~~etching process~~ adjusting of said chemistry further comprises monitoring and controlling:
the concentration of molybdate complex;
Fe concentration; and
Oxidation/Reduction Potential (ORP).

21. (Currently Amended) A method of manufacturing a metal TMoly mask for a tin-rich cap of an integrated circuit chip interconnect solder bump, said method comprising:
depositing a photoresist on both sides of a molybdenum foil sheet, wherein said molybdenum foil sheet is approximately 4 mils thick and said photoresist is approximately 12 microns thick;

exposing and developing said photoresist to have ~~at least one~~ a first opening on a first side of said molybdenum foil sheet and a second opening on a second side of said molybdenum foil sheet, wherein said first opening has a first diameter of approximately 7 mils and said second opening has a second diameter of approximately 11 mils having a diameter of at least approximately 7 mil; and

simultaneously etching both sides of said molybdenum foil for a time period sufficient to produce a via through said molybdenum foil sheet such that said via has a third diameter of approximately 10 mils adjacent to said first opening, a fourth diameter of approximately 14 mils adjacent to said second opening and a knife-edge of 0.2 mils,

wherein said etching comprises:

using an etchant spray with a pressure of approximately 5 psi, wherein said etching process forms at least one via in said molybdenum foil sheet, and wherein said via has a diameter of approximately 10 mil to 14 mil;

periodically adjusting a chemistry of said etchant spray to avoid a reduction in etchant activity; and

undercutting said photoresist adjacent to both said first opening and said second opening to form an unsupported edge of said photoresist, and

wherein said depositing of said photoresist that is approximately 12 microns thick, said using of said etchant spray with said pressure of approximately 5 psi, and said adjusting of said chemistry ensures that after said time period said unsupported edge survives.

22. (Canceled).

23. (Currently Amended) The method in claim ~~[[22]]~~ 21, wherein said etching process produces an asymmetric via that is smaller on said first side of said molybdenum foil sheet when compared to said second side of said molybdenum foil sheet.

24. (Currently Amended) The method in claim 21, ~~wherein said etching process undercuts molybdenum adjacent said photoresist, leaving an unsupported edge of said photoresist after completion of said etching process~~ wherein ensuring that after said time period said unsupported edge survives allows reliable image formation to be achieved.

25. (Currently Amended) The method in claim ~~[[24]]~~ 21, ~~further comprising wherein~~ said adjusting of said chemistry comprises adjusting the pH of said etchant spray at least three times during said etching process to prevent damaging said unsupported edge of said photoresist.

26. (Original) The method in claim 25, wherein said process of adjusting the pH of said etchant spray comprises adding sodium hydroxide to said etchant spray.

27. (Original) The method in claim 21, further comprising removing said photoresist after said etching process.

28. (Currently Amended) The method in claim 21, wherein said ~~etching process~~ adjusting of said chemistry further comprises monitoring and controlling:

the concentration of molybdate complex;

Fe concentration; and

Oxidation/Reduction Potential (ORP).